STATE OF MONTANA
MONTANA DEPARTMENT OF TRANSPORTATION
JOB PROFILE

☑ Update

☐ Formal Review

Date Submitted _____

SECTION I - Identification

Working Title: Hydraulics Engineer

Department: Transportation

Job Code Number: 172516

Division & Bureau: Engineering Division
Highways Bureau

Job Code Title: Civil Engineering Specialist

Section & Unit: Hydraulics Section

Pay Band: 6

Work Address: 2701 Prospect Ave.
Helena, MT 59620

Position Number: 32029

Phone: 406-444-6246

☐ FLSA Exempt ☑ FLSA Non-Exempt ☐ Non-Union ☐ MPEA ☐ Blue Collar

Profile Completed By: David Hedstrom

Work Phone: 406-444-7961

Work Unit Mission Statement or Functional Description:

The Engineering Division prepares projects for bidding and coordinates highway construction. The Division is made up of Preconstruction and Construction, Engineering Management, Research and five District Construction Offices in Missoula, Butte, Great Falls, Glendive, and Billings for budget and workforce purposes. Preconstruction functions are administered by the Highways, Right of Way, Bridge, Environmental, Consultant Design, and Traffic and Safety bureaus; and the Engineering Information Services Section.

The Highways Bureau is responsible for planning and developing the details of construction projects. This includes determining the location and design features, details, quantities and costs; conducting public meetings and working with local officials; and evaluating, approving and incorporating requested design modifications into the plans during the right-of-way acquisition and permitting phases. The Bureau is made up of diverse programs in the Road Design, Hydraulics, and Survey & Photogrammetry sections.

The Hydraulics Section is primarily responsible for the hydraulic waterway designs and engineering studies necessary to complete the hydrologic and hydraulic aspects of the Department of

Transportation's highway construction and maintenance programs. The Hydraulics Section is actively involved in the design of 400 to 500 highway projects during various stages of development at any one time.

Describe the Job's Overall Purpose:

This position is a Hydraulics Engineer that assists the District Hydraulic Engineer(s) and is responsible for completing studies and designs in the area of bridge waterway openings, scour analysis, culverts, fish passage, storm drains, channel changes, stream restoration, and irrigation and maintains design files for projects in various stages of development to ensure hydraulic activities are completed on schedule. The position is also responsible for hydraulic engineering analysis, participating in plan-in-hand inspections, environmental recommendations, CADD designs and other duties as assigned. The position reports to the Hydraulics Operations Engineer (#34009) and does not directly supervise other agency personnel.

SECTION II - Major Duties or Responsibilities

This section should be a clear concise statement of the position's major duties and the approximate percent of work time for each duty ***% of Time***

A. HYDRAULIC ENGINEERING DESIGN 50%

1. Performs hydraulic designs for the size, type, and location of drainage structures based on the evaluation of survey data and interpretation of developed mathematical models by attending field reviews, gathering and analyzing technical data, and evaluation of site risks and costs utilizing established engineering theories, principles, and techniques of Civil Engineering in addition to knowledge in the use of water surface profile models and geomorphology in order to develop and make engineering recommendations.

2. Develops mathematical models of existing and proposed hydraulic structures to establish baseline performance and to make recommendations for replacement using field survey data and computer hydraulic analyses programs. Utilizes the results of hydraulic models to calculate bridge contraction, abutment, and pier scour. Coordinates scour prediction results with an interdisciplinary team to determine appropriate countermeasures to mitigate scour through analysis and presentation of data. Analyzes stream stability in the vicinity of highways to provide input on roadway alignment and stream countermeasure recommendations. Researches and minimizes floodplain encroachments by highway facilities to minimize erosion and flooding potential to adjacent properties and the highway facility. Prepare and submit floodplain permit applications to local counties in order to obtain approval to construct highway facilities in the floodplains.

3. Performs culvert life analysis of existing and proposed culverts and specifies countermeasures against deterioration of metal and concrete culverts using established durability guidelines.

4. Completes design analyses and prepares details and cost estimates for bridge waterway and culvert openings, channel changes, storm drain facilities, retention/detention systems, pump stations, flood routing alternatives, utility modifications, and irrigation facilities to be included in highway construction plans.

5. Provide design solutions in the area of fish passage issues and bio-engineered bank protection devices to mitigate project-related impacts.

B. HYDROLOGIC ENGINEERING ANALYSIS 30%

1. Performs hydrologic analyses of historic stream flow data using statistical or parametric methods to determine flows that may be expected at each stream or river crossing using established statistical principles and practices, evaluation of hydrologic and hydraulic computer models, knowledge of site risk, and evaluation of cost estimates.

2. Determine flood frequency curves for the stream crossing and compute stage elevations for these flows. Select a design flood based on an evaluation of construction costs, potential backwater damage to adjacent landowners, length of detour, amount of traffic that would be inconvenienced if the roadway was overtopped, available emergency supply and evacuation routes and evaluate the potential for loss of life, budgetary constraints, and the effects of the structure on the river channel stability and surrounding environment.

C. HYDRAULIC ENGINEERING REVIEW 10%

1. Coordinates hydraulic design efforts with other units, sections, and bureaus in the MDT to ensure plan compatibility and progress during the preconstruction phase of a project through meetings, memos, reports, and field reviews. Ensures final contract package is in conformance with Hydraulic recommendations.

2. Participates in Plan-in-Hand inspections to ensure proposed design features are compatible with the natural terrain, project development, and the highway facility. This is done by providing input on design, constructability, and contract clarity regarding hydraulic features and making recommendations for plan revisions.

D. MISCELLANEOUS ANALYSIS 10%

Performs related work as required including the following:

1. Reviews aerial photos, contour maps, and delineated floodplain maps; analyzes survey data, soil data, stream flow data, economic data, and conducts field inspections to evaluate proposed highway alignments for potential hydraulic problems during location and planning phases utilizing knowledge, experience, and judgment in hydraulics, hydrology, river mechanics, fluvial geomorphology, rural highway construction and urban construction.

2. Provides comments to the lead agency for inclusion in environmental documents regarding permits and approvals to be obtained, water quality impacts, and hydraulic related impacts of any channel modification or fill into wetlands, irrigation conflicts, and urban storm drain conflicts.

3. Utilizes CADD software to interpret and import Data Collector survey into water surface profile models in order to develop bridge waterway opening recommendations utilizing knowledge of micro-station software. Uses CADD software to develop contour maps from data collector survey utilizing knowledge in Geopack software.

4. Evaluates and provides input on proposed features (subdivision, flood control work, etc.) and other administrative actions (floodplain delineations, watershed management plans, etc.)

which may have adverse effects upon existing and proposed highway facilities. Evaluates and provides recommendations for solution or resolution of hydraulic related problems encountered during right-of-way negotiations or damage claims to determine their validity and recommend corrective measures when deemed appropriate.

5. Assigns work and reviews progress of less experienced engineers and technicians to ensure completeness and compliance to Departmental and Section standards, policies, and procedures.

6. Participates in the development of wetland mitigation plans, provides hydraulic expertise and coordinates with regulating agencies, design and construction personnel as required to implement proposals.

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1. ***The following duties and/or specific tasks listed under section II above are considered "essential functions" because they require specialized expertise and skill and are the primary reasons the job exists (they must be performed by this position with or without accommodations):***

Duty A: Hydraulics Engineering Analysis and Design
Duty B: Project Coordination

The following mental and physical demands are associated with these essential functions:

PHYSICAL

- Lifting heavy objects (manhole caps, analytical equipment, etc.) up to 50 lbs.
- Ability to walk over uneven terrain or in water
- Remaining seated for extended periods of time, with occasional walking; standing; bending
- Minor travel (200 miles/month)
- Operating a personal computer
- Communicate in writing, in person, and over the phone

MENTAL

- Ability to multi-task
- Demands for accuracy in all aspects of work
- Ability to meet inflexible deadlines
- Decision making that affects public health and safety
- Computing arithmetic operations
- Comparing data
- Compiling information
- Analyzing
- Coordinating
- Synthesizing
- Instructing

Predominant work is performed in a normal office environment and in the field, involving:

- Exposure to extreme weather
- Exposure to loud noises
- Exposure to confined spaces
- Exposure to high-speed traffic

2. ***Does this position supervise others?*** ☐ **Yes** ☑ **No**

   Number directly supervised:
   Position Number(s) of those supervised:

3. ***Attach an Organizational Chart.***

SECTION III - Minimum Qualifications - List minimum requirements for the first day of work.

Critical knowledge and skills required for this position:

KNOWLEDGE:

This position requires extensive knowledge of the theories, concepts, and principles of civil engineering, hydrology, hydraulics, fluvial geomorphology, river mechanics, and urban storm water and drainage systems. The position also requires thorough knowledge of the methods and practices of road and bridge construction and related policies, methods, procedures, specifications, and standards and regulations; environmental and geotechnical aspects of construction projects; advanced research methods and techniques; and applicable state, federal, local/county, AASHTO, and FHWA requirements and standards.

SKILLS:

The position requires skill in organizing and planning for the solution of complex engineering problems, especially those involving natural phenomena (i.e., hydrology and fluvial geomorphology); analyzing and evaluating engineering designs; and specialized analytical methods and techniques. The position also requires skill in the use of standard and specialized software applications, computer modeling techniques, analyzing and interpreting statistical information, and written and verbal communications.

Behaviors required to perform these duties:

See MDT Core Behaviors

Education:
Check the one box indicating minimum education requirements for this position for a new employee the first day of work:

☐ No education required	☐ Related AAS/2-years college/vocational training
☐ High school diploma or equivalent	☑ Related Bachelor's Degree
☐ 1-year related college/voc. training	☐ Related Master's degree

Please specify the acceptable fields of study:

Acceptable: Civil Engineering

Other education, training, certification, or licensing required (specify):

Certification as a FE is required. Registration as a PE in Montana is preferred.

Experience:
Check the one box indicating minimum work-related experience requirements for this position for a new employee the first day of work:

- ☐ No prior experience required
- ☐ 1 year
- ☐ 2 years
- ☐ 3 years
- ☑ 4 years
- ☐ 5 or more years

Other specific experience (optional):

24 Months of Hydraulic Design

Alternative Qualifications:
This agency will accept alternative methods of obtaining necessary qualifications.

☑ Yes ☐ No

Alternative qualifications include:

A training assignment may be considered for engineers lacking the required experience. To qualify, a minimum of 30 months of engineering experience (of which 12 months must be in highway hydraulic design) and an FE certificate in the State of Montana will be required.

SECTION IV – Other Important Job Information

- ☐ Fingerprint check
- ☐ Background check
- ☐ Valid driver's license
- ☐ Other; Describe

Other information including working conditions such as shifts, lifting requirements, travel or hours.

Most work is performed in a professional office environment with extensive travel throughout the District required to assess project requirements, attend meetings and conferences, and provide on-site technical expertise (up to 200 miles per month). The position requires periodic field work in high-risk environments involving hazards and demands associated with an active project site, including exposure to speeding traffic, loud noises, heavy equipment, and hazardous materials (e.g., hot asphalt, fumes, etc.). Site visits including traversing steep slopes to inspect culverts, bridges, and other hydraulic facilities and may also include review of storm drain systems, which involves climbing in and out of manholes that can be considered confined spaces and require special precautions to ensure safe air conditions.

SECTION V – Signatures

Signature indicates this statement is accurate and complete.

Employee:

Name: _____ Title: _____

Signature: _____ Date: _____

Immediate Supervisor:

Name: _____ Title: _____

Signature: _____ Date: _____

Bureau Chief:

Name: _____ Title: _____

Signature: _____ Date: _____

Division/District Administrator:

Name: _____ Title: _____

Signature: _____ Date: _____

Department Designee:

Jennifer Jensen/Designee — Chief Human Resources Officer, Human Resources Division

Signature: _____ Date: _____